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Criticism of a Theory of Electrical Resistance

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1924) seem to prove that Fairbourne's conclusions are incorrect, at least in part. However they did not consider the effect of adsorption. Experiments were undertaken to test Fairbourne's conclusions experimentally. Thus far the pressure effect which he predicts has not been detected.

IOWA STATE COLLEGE.

CRITICISM OF A THEORY OF ELECTRICAL RESISTANCE

JOHN A. ELDRIDGE

(ABSTRACT)

The theories which have been devised to account for electrical resistance have had a very meager success. The most serious fault with all such theories is the fact that they give an incorrect temperature coefficient of resistance. As is well known, the resistance of most metals is nearly proportional to the absolute temperature, while most of the theories give a value proportional to the square root of the temperature. The well-known theory of Bridgman proposed several years ago portended to give the proper relationship, but this appears to be due to a mistake in the analysis. Starting with the assumption that the electron goes unhindered within atoms, being occasionally stopped at the gaps between atoms, he supposes that the probability b of such stoppage (which is proportional to the resistance) is a function of the atomic radius r and the amplitude of oscillation a (the amplitude being in turn proportional to the temperature). He then proceeds to prove that $b = ka$ as follows:

$$b = \mathrm{f}(r, a) = \mathrm{f}(r, 0) + a\frac{d\mathrm{f}(r, 0)}{da} \text{ etc.,}$$

expanding in Taylor's series in powers of a. By assumption, $\mathrm{f}(r, 0) = 0$, and terms involving higher powers being omitted because "a is small compared with r," we have left

$$b = a\frac{d\mathrm{f}(r, 0)}{da}.$$

The derivative at $(r, 0)$ is constant, of course, and the proportion is shown. The dropping of the higher powers is not justified. Indeed it is *a priori* impossible by using only the postulate that b is a function of a to reach the conclusion that b is a linear function of a. The Bridgman theory, which was devised to explain pres-

sure effects, may be quite serviceable in the field, but it cannot be said to give without further assumption, the proper temperature coefficient of resistance.

STATE UNIVERSITY OF IOWA.

A STUDY IN EXAMINATION METHODS

C. J. LAPP

(*ABSTRACT*)

A carefully set-up experiment in methods of conducting examinations in physics is being carried out. All of the variable human factors have been eliminated as far as possible. Students hearing the same lectures, studying the same text-book, and writing the same examinations are pitted against each other: one group using their books and any notes which they care to bring to class with them, the other group using no notes or helps of any kind. The results obtained in this experiment are expected to shed definite light upon the much discussed problem of the aid or hindrance of books during examinations.

STATE UNIVERSITY OF IOWA.

THE STUDY OF AN OBJECTIVE ACHIEVEMENT EXAMINATION IN PHYSICS

C. J. LAPP

(*ABSTRACT*)

A carefully prepared objective achievement examination in physics was given to a class of freshmen for their final examination at the end of the first semester. To compare with these results, there was available twenty-seven ten-minute, and fifty-minute examinations. The correlation between these two sets of data for about 230 students was extremely high.

STATE UNIVERSITY OF IOWA

THERMOELECTRIC EFFECT IN SINGLE CRYSTAL ZINC WIRES

E. G. LINDER

(*ABSTRACT*)

Single crystal zinc wires of any desired orientation may be prepared by the method of Gomperz. The thermo-electric power of